

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-091736

(43)Date of publication of application : 06.04.2001

(51)Int.Cl.

G02B 5/30

(21)Application number : 11-265412

(71)Applicant : NITTO DENKO CORP

(22)Date of filing : 20.09.1999

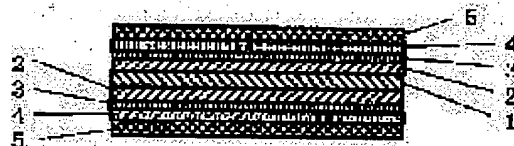
(72)Inventor : KUSUMOTO SEIICHI
SHODA TAKAMORI

(54) POLARIZING FILM AND POLARIZING PLATE

(57)Abstract:

PROBLEM TO BE SOLVED: To develop an iodine-based polarizing film that hue as neutral as possible is obtained when disposed in the cross-Nicol position and as a result a color liquid crystal display device having good black display and excellent reproducibility of colors can be formed.

SOLUTION: The film consists of a stretched film 1 containing iodine, and has such property that when the film is disposed in the cross-Nicol position, the ratio of the absorption peak A in a 550 to 650 nm wavelength region to the absorption peak B in a 450 to 520 nm wavelength region in the absorbance characteristic of the film is ≤ 1.5 . The polarizing plate is produced by forming a transparent protective layer 2 on one surface or both surfaces of the polarizing film. Thus, the film causes little leak of light when disposed in the cross-Nicol position, and has excellent mass-productivity.



LEGAL STATUS

[Date of request for examination]

22.01.2004

[Date of sending the examiner's decision of rejection]

* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the polarization film of the suitable iodine system for formation of the liquid crystal display of the color display which is excellent in the repeatability of a color etc., and its polarizing plate.

[0002]

[Background of the Invention] Conventionally, the polarization film which is made to carry out impregnation of the iodine to a hydrophilic high polymer film, and comes to carry out drawing processing was known. Realizing color display which this polarization film is used for the liquid crystal display etc., and is excellent in the repeatability of a color in that case is expected to attain a perfect black display as much as possible.

[0003] Although the polarization film which offers a neutral hue could realize the aforementioned perfect black display when it had arranged to the cross Nicol's prism, if it was in the conventional polarization film, when it had arranged to the cross Nicol's prism, it did not become a neutral hue, but there was a trouble which the strong coloring by leakage light generates.

[0004]

[The technical technical problem of invention] This invention makes a technical problem development of the polarization film of the iodine system which can form the liquid crystal display of the color display which offers a neutral hue as much as possible, and is excellent in the repeatability of a good black display, as a result a color, when it has arranged to the cross Nicol's prism.

[0005]

[Means for Solving the Problem] This invention consists of an oriented film of iodine content, and the polarizing plate characterized by coming to prepare transparent protection layer in the polarization film characterized by absorption peak B in absorption peak [in the wavelength range of 550-650nm in the absorbance property in the case of having arranged it to the cross Nicol's prism] A / the wavelength range of 450-520nm being 1.5 or less and one side of the polarization film, or both sides is offered.

[0006]

[Effect of the Invention] According to this invention, when it has arranged to the cross Nicol's prism, the polarization film which there is little leakage light and is excellent in blackness thru/or neutral hue nature can be obtained, and the liquid crystal display of a good black display, as a result the color display which is excellent in the repeatability of a color can be realized using it. Moreover, it excels that it is the polarization film of an iodine system also in mass production nature.

[0007]

[Embodiment of the Invention] The polarization film by this invention consists of an oriented film of iodine content, and absorption peak B in absorption peak [in the wavelength range of 550-650nm in the absorbance property in the case of having arranged it to the cross Nicol's prism] A / the wavelength range of 450-520nm consists of 1.5 or less thing.

[0008] a polarization film more desirable than the point of the consolidation of the blackness by

reduction of the leakage light in the case of having arranged to the cross Nicol's prism, i.e., neutral hue-izing, -- said absorption peak A carried out -- based on it in the wavelength range of 580-620nm, absorption peak B, and the ratio of absorption peak A / absorption peak B according to it in the wavelength range of 460-490nm above all, it is especially 1.2 or less thing 1.3 or less above all 1.4 or less. If the peak ratio exceeds 1.5, there is much leakage light in the case of having arranged to the cross Nicol's prism, coloring strong with the leakage light will be produced, and the display grace of a black display will fall greatly.

[0009] It can be performed by the proper approach according to the former, such as a wet method which is made to carry out impregnation of the iodine and carries out drawing processing within a dyeing bath, manufacture of a polarization film conveying the film which consists of proper hydrophilic macromolecules, such as for example, a polyvinyl alcohol system film, and a partial formal-ized polyvinyl alcohol system film, an ethylene-vinylacetate copolymer system partial saponification film. In that case, dichroism matter other than iodine (for example, dichromatic dye etc.) can also be used together.

[0010] Absorption peak A / absorption peak B ratio described above in the above For example, so that the phase contrast of a film may be measured using 900nm wavelength light and the phase contrast may not exceed 1100nm at the time of dyeing / drawing processing within a dyeing bath, controlling especially 10-70 degrees C of 15-60 degrees C of bath temperature at 20-40 degrees C above all The method which carries out drawing processing so that it may become the range of 100-1000nm especially can attain 10-1050nm above all.

[0011] Usually, 50% or less, the draw magnification by the above is not limited to them 1 to 20% above all, although especially the thickness of the polarization film which is 2 - 10% and is formed is 5-80 micrometers usually. Achievement of the absorption peak ratio of the above-mentioned object by this method, i.e., achievement of improvement in the neutral hue in a cross Nicol's prism, is because the generation ratio of the Pori iodine complex in a polarization film was controlled.

[0012] That is, the wavelength range of 550-650nm which influences the decision of the hue of a polarization film greatly, and since (absorption peak A) and the wavelength range of 450-520nm near the 580-620nm wavelength range, and a strong (absorption peak B) absorption peak are shown near the wavelength range of 460-490nm above all, this Pori iodine complex can adjust the hue of a polarization film by controlling the generation ratio of the Pori iodine complex.

[0013] The polarization film by this invention can be preferably used for formation of various kinds of optical equipments, such as a liquid crystal display, etc. It can also consider as the polarizing plate which prepared more than two-layer [of proper stratum functionale, such as transparent protection layer, thru/or an optical layer / one layer or two-layer] in one side or both sides of a polarization film on the occasion of the practical use. The example was shown in drawing 1 . 1 is an adhesive layer and, as for 5, a polarization film and 2 are [transparent protection layer and 3 / a rebound ace court layer and 4] separators.

[0014] Addition of the above mentioned transparent protection layer can use the proper transparence matter for the formation for the purpose of the water resisting property of a polarization film, improvement in handling nature, etc. Above all, the plastics which is excellent in transparency, a mechanical strength and thermal stability, moisture electric shielding nature, etc. is used preferably. Incidentally as the example, the resin of heat-curing molds, such as polyester system resin, acetate system resin, polyether sulphone system resin and polycarbonate system resin, polyamide system resin and polyimide system resin, polyolefine system resin and acrylic resin or acrylic and an urethane system, an acrylic urethane system, an epoxy system, and a silicone system, thru/or an ultraviolet curing mold etc. is raised.

[0015] Although transparent protection layer considered as the spreading method and film of plastics, it may be formed by the method with the proper laminating method through a glue line etc., and its thickness is also arbitrary. Especially generally let 1-300-micrometer 500 micrometers or less above all be the thickness of 5-200 micrometers. Moreover, transparent protection layer shall have detailed irregularity structure on a front face for the purpose of prevention, diffusion thru/or an anti glare of

sticking, etc.

[0016] The conductive thing which consists of a silica, an alumina, a titania and a zirconia, tin oxide and indium oxide, cadmium oxide, antimony oxide, etc. can also form formation of the transparence resin layer of surface detailed irregularity structure by the method with the proper method which ****--ization-processes a front face by the method and sandblasting which make transparence particles, such as an organic system particle which consists of a polymer for which a bridge is not constructed [a certain inorganic system particle, bridge formation, or], contain, mat processing, etc. in addition, a transparence particle -- general -- a thing with a mean particle diameter of 0.5-20 micrometers -- per [2] transparence resin 100 weight section - 50 weight sections -- 5 - 25 weight ***** is not limited to this above all.

[0017] On the other hand, a rebound ace court layer is prepared for the purpose of surface breakage prevention etc., and is usually attached to the outside surface of transparent protection layer 2 like the example of drawing. The rebound ace court layer 3 is formed as a coating layer of the hardening mold resin which could form with the proper ingredient which is excellent in a degree of hardness, and was generally illustrated by the above-mentioned transparent protection layer etc. On the occasion of the formation, distributed content of the transparence particle can be carried out for the purpose of anti glare processing etc. according to the above-mentioned transparent protection layer.

[0018] Moreover, a polarizing plate shall have the adhesive layer 4 for pasting the one side or both sides with other members, such as a liquid crystal cell, like the example of drawing. Proper slime and a proper binder can be used for formation of the adhesive layer, and there is especially no definition in it. Incidentally as the example, what makes a base polymer proper polymers, such as an acrylic polymer, a silicone system polymer and polyester, polyurethane, a polyamide and a polyether, a fluorine system, and a rubber system, is raised.

[0019] It is desirable that it is the adhesive layer which is excellent in optical transparency, shows the adhesion property of coherent [moderate wettability and coherent / moderate], and adhesive, and is excellent in weatherability, thermal resistance, etc. like an acrylic binder above all. Moreover, moisture absorption is low and it is more desirable than points, such as lowering of the optical property by prevention of the foaming phenomenon by moisture absorption, or a peeling phenomenon, a differential thermal expansion, etc., curvature prevention of a liquid crystal cell, as a result the plasticity of a liquid crystal display that is excellent in endurance with high quality, that it is the adhesive layer which is excellent in thermal resistance.

[0020] The adhesive layer may contain the proper additive by which adhesive layers, such as resin of a natural product or a compost, a bulking agent which consists of adhesive grant resin, a glass fiber, a glass bead and a metal powder, other inorganic powder, etc. above all, a pigment and a coloring agent, and an antioxidant, have been added. Moreover, an adhesive layer contains the above-mentioned transparence particle, and may show optical diffusibility.

[0021] The attachment of an adhesive layer makes the solvent which consists of the independent object or mixture of a proper solvent, such as toluene and ethyl acetate, dissolve or distribute slime thru/or its constituent, and prepares about 10 - 40% of the weight of binder liquid. Proper methods, such as a method which attaches it directly on the predetermined side of a polarizing plate by proper expansion methods, such as a flow casting method and a coating method, or a method which forms an adhesive layer on a separator according to the above, and carries out transfer of it on the predetermined side of a polarizing plate, can perform.

[0022] An adhesive layer can also be prepared as a superposition layer of things, such as a different presentation or a class. The thickness of an adhesive layer can be suitably determined according to the purpose of use, adhesive strength, etc., and, especially generally is set to 10-100 micrometers 5-200 micrometers above all 1-500 micrometers. In addition, when preparing in the front flesh-side both sides of a polarizing plate, those adhesive layers may have a presentation, a the same class, etc., and may differ.

[0023] In addition, it is desirable to carry out tentative installation covering with a separator 5 for the purpose of a pollution control etc. until it presents practical use with the adhesive layer like the example

of drawing, when an adhesive layer is exposed to an outside surface. The method which establishes the exfoliation coat by proper removers, such as a silicone system, a long-chain alkyl system, a fluorine system, and a molybdenum sulfide, in a proper Japanese tissue object if needed can perform formation of a separator.

[0024] In addition, proper things, such as a plastic film, a rubber sheet, paper and cloth, a nonwoven fabric, a network and a foaming sheet, and metallic foils, those lamination objects, can be used for the aforementioned Japanese tissue object. The thickness of a Japanese tissue object can be suitably determined according to reinforcement etc., and, especially generally is set to 10-200 micrometers 5-300 micrometers above all 500 micrometers or less.

[0025] In addition, the aforementioned separator can also be used as the protection film aiming at the breakage prevention on the front face of a polarizing plate etc. That is, although a separator enables it to exfoliate in an interface with the adhesive layer which it pastes up, in case a protection film exfoliates a Japanese tissue object from a polarizing plate, it enables it to exfoliate with an adhesive layer, therefore, in the case of a protection film, the front face of a polarizing plate exposes it by the exfoliation.

[0026] In addition, the polarizing plate by this invention may be the thing of the gestalt which added the proper optical layer used for formation of a liquid crystal display etc. like the elliptically-polarized-light plate which carried out the laminating of a phase contrast plate or the improvement plate in brightness, or the improvement polarizing plate in brightness. Although this optical layer can be added also by the method which carries out a laminating separately one by one in manufacture processes, such as a liquid crystal display, some which carried out laminating addition beforehand have the advantage in which it excels in stability, assembly-operation nature, etc. of quality, manufacture effectiveness, such as a liquid crystal display, is raised, and it deals.

[0027] There may not be especially definition about the class of optical layer to add, therefore a polarizing plate may be the thing of a reflective mold etc. Moreover, the aforementioned phase contrast plate may also have the proper objects, such as one half, a wavelength plate of $1/4$ grades, and viewing-angle compensation. In addition, in the case of **** laminating type [, such as the above mentioned elliptically-polarized-light plate,], the laminating may be performed through proper adhesion means, such as an adhesive layer.

[0028] in addition, a thing for said reflective mold polarizing plate carried out to form the liquid crystal display of the type which is what prepared the reflecting layer, and a polarizing plate is reflected and displays the incident light from a check-by-looking side (display side) on it etc. -- it is -- built-in of the light source of a back light etc. -- being omissible -- thin-shape-izing of a liquid crystal display -- a scale -- being easy -- etc. -- it has an advantage. A method with the proper method which attaches the reflecting layer which becomes one side of a polarizing plate from a metal etc. through transparent protection layer etc. if needed can perform formation of a reflective mold polarizing plate.

[0029] That is, what attached the foil and vacuum evaporatio film which consist of reflexivity metals, such as aluminum, to one side of the transparent protection layer which carried out mat processing as an example of a reflective mold polarizing plate if needed, and formed the reflecting layer in it is raised. Moreover, what prepared on the transparent protection layer of transparence particle content, and was made into the reflecting layer of surface detailed irregularity structure is raised.

[0030] The reflecting layer of the above mentioned surface detailed irregularity structure diffuses incident light by scattered reflection, prevents directivity and the appearance [GIRAGIRA / appearance], and has the advantage which can control the nonuniformity of light and darkness. Formation of the reflecting layer of the detailed irregularity structure in which the surface detailed irregularity structure of transparent protection layer was made to reflect can be performed by the approach of attaching a metal directly on the surface of transparent protection layer by methods with proper vacuum evaporatio method, plating method, etc., such as for example, a vacuum deposition method, an ion plating method, and a sputtering method, etc.

[0031] On the other hand, as an example of the above-mentioned phase contrast plate, what supported with the film a polycarbonate, polyvinyl alcohol and polystyrene, polymethylmethacrylate and polypropylene, other polyolefines, the birefringence film which comes to carry out drawing processing

of the film which consists of a proper polymer like polyarylate or a polyamide and the oriented film of a liquid crystal polymer, and the orientation layer of a liquid crystal polymer is raised.

[0032] A phase contrast plate may be the dip oriented film which may have the proper phase contrast embraced in activity eye, and controlled the refractive index of the thickness direction. Moreover, you may be what carried out the laminating of two or more sorts of phase contrast plates, and controlled optical properties, such as phase contrast. In addition, the aforementioned dip oriented film can paste up a heat shrink nature film for example, on a polymer film, and can obtain it to operation-ization of the shrinkage force by heating with the method which processes [drawing-] or/and processes [contraction-] a polymer film, the method to which slanting orientation of the liquid crystal polymer is carried out.

[0033] on the other hand, the above-mentioned improvement plate in brightness -- a polarization division plate etc. and nominal ***** -- there are things, if incidence of the natural light is carried out, the linearly polarized light of a predetermined polarization shaft or the circular polarization of light of the predetermined direction will be reflected, and other light shows the property to penetrate and is used for the purpose of improvement in the brightness of a liquid crystal display.

[0034] Namely, while the improvement plate in brightness carries out incidence of the light from the light source of a back light etc. and obtains the transmitted light of a predetermined polarization condition While aiming at loading of the light which is made to reverse the reflected light through a reflecting layer etc., is made to carry out re-incidence to the improvement plate in brightness, is made to penetrate the part or all as a light of a predetermined polarization condition, and penetrates the improvement plate in brightness It is used for the purpose of raising brightness with the method which aims at buildup of the quantity of light which supplies the polarization which cannot be easily absorbed by the polarizing plate and can be used for a liquid crystal display etc.

[0035] therefore, as an improvement plate in brightness, like the multilayer layered product of the thin film film from which the multilayered film and refractive-index anisotropy of a dielectric are different, for example what shows the property of penetrating the linearly polarized light of a predetermined polarization shaft, and reflecting other light (3 M company make --) cholesteric-liquid-crystal layers, such as D-BEF, and the thing (the NITTO DENKO CORP. make --) which supported the oriented film and its orientation liquid crystal layer of a cholesteric-liquid-crystal polymer on the film base material above all The circular polarization of light of methods of left Uichi like, such as PCF350, and a product made from Merck, Transmax, is reflected, and other light can use what has the proper thing which shows the property to penetrate.

[0036] It can be made to penetrate efficiently with the improvement plate in brightness of the type which penetrates the linearly polarized light of the above mentioned predetermined polarization shaft, controlling the absorption loss by the polarizing plate by arranging a polarization shaft and carrying out incidence of the transmitted light to a polarizing plate as it is.

[0037] On the other hand, although incidence can be carried out to a polarizing plate as it is with the improvement plate in brightness of the type which penetrates the circular polarization of light like a cholesteric-liquid-crystal layer, it is more desirable than the point which controls an absorption loss to linearly-polarized-light-ize the transparency circular polarization of light through a phase contrast plate, and to carry out incidence to a polarizing plate. By incidentally arranging between a polarizing plate and the improvement plate in brightness, using a quarter-wave length plate as the phase contrast plate, the circular polarization of light is convertible for the linearly polarized light.

[0038] The phase contrast plate which functions as a quarter-wave length plate in the large wavelength range, such as a light region, can be obtained with the method which superimposes the phase contrast layer which shows the phase contrast layer which functions as a quarter-wave length plate to the homogeneous lights, such as light with a wavelength of 550nm, and other phase contrast properties, for example, the phase contrast layer which functions as 1/2 wavelength plate. Therefore, the phase contrast plate arranged between a polarizing plate and the improvement plate in brightness may consist of a phase contrast layer more than one layer or two-layer.

[0039] In addition, also about a cholesteric-liquid-crystal layer, although reflected wave length is different, by considering as two-layer or the arrangement structure superimposed three or more layers in

combination, what reflects the circular polarization of light in the large wavelength range, such as a light region, can be obtained, and the transparency circular polarization of light of the large wavelength range can be acquired based on it.

[0040] Each class, such as transparent protection layer which forms the above-mentioned polarizing plate, a rebound ace court layer, an adhesive layer, and a phase contrast plate, an improvement plate in brightness, may be what gave ultraviolet absorption ability with the method with the proper method processed with ultraviolet ray absorbents, such as for example, a salicylate system compound, a benzo phenol system compound, a benzotriazol system compound, and a cyanoacrylate system compound, a nickel complex salt system compound.

[0041] The polarization film thru/or polarizing plate by this invention can be preferably used for formation of various equipments, such as a liquid crystal display, etc. The liquid crystal display can be formed as what has the proper structure according to the former, such as a transparency mold which comes to arrange the polarization film thru/or polarizing plate by this invention on one side or the both sides of a liquid crystal cell, and a reflective mold or a mold both for transparency / reflective.

[0042]

[Example] in the water bath liquid of ordinary temperature which dissolved iodine for the polyvinyl alcohol film with an example 1 thickness of 80 micrometers, drawing processing be carried out, the polarization film be formed in the bottom of measurement of the phase contrast through the 900nm wavelength light by the automatic birefringence meter (the Oji measuring machine machine company make), control the phase contrast, the triacetyl cellulose film be pasted up on the both sides through the polyvinyl alcohol system glue line, and the polarizing plate with a thickness of about 180 micrometers be obtained.

[0043] As a result of having arranged the aforementioned polarizing plate to the cross Nicol's prism and a spectrophotometer's (Shimadzu Corp. make's) investigating an absorbance property, the absorption peak appeared in the wavelength of 610nm (peak A), and 480nm (peak B), and the peak ratio (it is the same A/B and the following) was 0.96.

[0044] According to example 2 example 1, the peak ratio obtained the polarizing plate of 1.04.

[0045] According to example 3 example 1, the peak ratio obtained the polarizing plate of 1.17.

[0046] According to example 4 example 1, the peak ratio obtained the polarizing plate of 1.37.

[0047] According to the example example 1 of a comparison, the peak ratio obtained the polarizing plate of 2.12.

[0048] It piled up and two of the polarizing plates obtained in the assessment trial example and the example of a comparison were pasted up so that the absorption shaft was parallel (white display) or might intersect perpendicularly (black display), visual observation of the transmitted light or reflected light was carried out, and white and a black display index were investigated. The result was shown in degree table. In addition, assessment is based on the following criteria.

[0049] coloring to which display grace reduces remarkably by the coloring improper :black display which does not have trouble in display grace becoming blue although white display index A blackness falls a little and there is blueness: Good whiteness good: although it is not white, the coloring which does not have trouble in display grace is impossible -- coloring black display index A coloring of :yellow is easily strong and display grace reduces remarkably: Good blackness good: [0050]

Example 1 Example 2 Example 3 Example 4 Ratio ** Example White display index A A A A A Black display index A A A Good Improper

[Translation done.]